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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/893,035	06/27/2001	Hag-ju Cho	5649-874	3421

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EXAMINER

KIELIN, ERIK J

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 04/01/2003

14

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/893,035

Applicant(s)

CHO, HAG-JU

Examiner

Erik Kielin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7 February 2003 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-13 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The newly added limitation to claim 1 states, that "the first metal oxide layer [200 in Fig. 1] and the second surface portion of the insulation layer do not overlap." The "second surface portion" is defined earlier in claim 1 to be that portion of the surface of "insulation layer" (110 in Fig. 1) which is not exposed by the conductive layers 100 and 120 lying above and below. This then defines the second surface portion as the interface between 120 and 110 and also between 100 and 110. Accordingly, the horizontal portion of the layer 200 overlaps the "second surface portion." Moreover, the specification has no antecedent basis for this claim language. Because

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both the drawing and the specification lack antecedent basis for the newly added limitation, feature is not enabled.

The remaining claims are rejected for depending from the above rejected claims. For the purposes of patentability, the claims will be interpreted in light of the specification and Figs. for which Applicant has provided enablement.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-6, 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's submitted reference, **KR 2000-25706**, in view of US 6,203,613 B1 (**Gates et al.**).

Regarding claim 1, **KR 2000-25706** discloses the insulation layer **14**, upper **16** and lower **12** electrodes, wherein only the first surface portion (i.e. the exposed portion) of the insulating layer **14** exposed by the upper and lower electrodes is covered with a first metal oxide **22** which serves as a reaction barrier layer to prevent damage to the insulating layer **14** during further processing. The second surface portion (i.e. the unexposed surface portion of the insulating layer) is not covered by metal oxide and does not overlap the second surface portion. (See Abstract and Fig. 4a.)

KR 2000-25706 also discloses that the metal oxide (Al_2O_3 or TiO_2) may be formed by atomic layer deposition (p. 5, lines 22-24), but it is unclear --in the absence of a translation-- to

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determine if the method of ALD is explained, such as presently claimed in instant claims 2, 5, and 6.

Gates teaches a method of treating an oxygen-containing insulation layer with a metal precursor reactive with oxygen using ALD to form single or plural layers of metal oxide. (See cols. 7-10.) **Gates**, moreover, says that the ALD method is useful for fabricating gate and capacitor dielectrics and reaction barrier layers (col. 3, lines 20-25) such as the reaction barrier layer **22** in **KR 2000-25706**, used to protect the insulating layer **14** therein, as noted above.

Gates also teaches the specific method steps of ALD deposition including, pulsing metal precursor or diluted metal precursor and then inert carrier (cols. 7-10) and argon as the inert gas is taught at col. 7, line 14.

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use ALD and the ALD conditions in **Gates** for forming the reaction barrier metal oxide layers in **KR 2000-25706**, because **Gates** teaches that the method is good for forming reaction barrier layers in integrated circuits, such as those in **KR 2000-25706**.

Regarding claims 3, 4, and 10, although the conditions of pulse time, flow rates and temperatures are not exactly as instantly claimed, each of these parameter ranges overlaps or is nearby those in **Gates** (cols. 7-10), amounting to a matter of routine optimization. (See MPEP 2144.05.) It would have been obvious for one of ordinary skill in the art, at the time of the invention to optimize the ALD conditions of the **Gates** method to form the reaction barrier layer (i.e. "the first metal oxide") of **KR 2000-25706**, to form the best reaction barrier layer, according to precedent.

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Regarding claim 9, it is unclear if **KR 2000-25706** teaches the metal precursors for the ALD of the metal oxide. The claimed metal precursors are taught in **Gates** at least at col. 4, lines 56-64. It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the metal precursors of **Gates**, as the metal precursors in **KR 2000-25706** because **Gates** also uses ALD to form aluminum oxide and teaches that the metal precursors are appropriate for aluminum oxide deposition. Moreover, it has been held that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. (See MPEP 2144.07.)

Regarding claims 11 and 12, the insulation layer **14** of **KR 2000-25706** is a ferroelectric capacitor layer.

Regarding claim 13, the encapsulating oxide **18** is taught in **KR 2000-25706**. Also note, because the layers of the first oxide layer **22** in **KR 2000-25706** are built up layer-by-layer since ALD is used, each additional monolayer layer encapsulates the layer before it. Accordingly, the first metal oxide layer and the insulation layer are necessarily encapsulated by a second metal oxide layer, by virtue of the method by which ALD works, even if the encapsulating layer is not considered to be **18**.

6. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **KR 2000-25706** in view of **Gates** as applied to claims 1 and 2 above, and further in view of US 6,335,240 B1 (**Kim et al.**).

The prior art of **KR 2000-25706** in view of **Gates**, as explained above, discloses each of the claimed features except for thermally treating the integrated circuit device in oxygen.

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Kim teaches annealing conditions for ALD deposited metal oxide films using O₂ at a temperature of 150-900 °C with exemplary embodiments at 450 °C, which falls within Applicant's claimed range of 400-600 °C. (See **Kim**, Abstract; col. 8, Table 3).

It would be obvious for one of ordinary skill in the art, at the time of the invention, to use the densification treatment of the metal oxide provided in **Kim** in the method of **KR 2000-25706** in view of **Gates** in order to densify the ALD layer and thereby to provide better reaction barrier layer protection.

Although the time is not as exactly claimed in claim 8, the choice would be a matter of routine optimization with a single variable. One would be motivated to find the time required to densify the thin film in **KR 2000-25706** in view of **Gates** for the specific purpose therein to provide protection to the insulating layer of the capacitor. (See MPEP 2144.05.)

Response to Arguments

7. Applicant's arguments filed 7 February 2003 in Paper No. 13 have been fully considered but they are not persuasive.

Applicant argues that **KR 2000-25706** does not teach the feature wherein the metal oxide layer does not overlap the second surface portion of the insulating layer. First, as noted above, Applicant does not teach this feature, and the claims have been accordingly interpreted in light of the specification. Accordingly, Applicant's argument is moot. Moreover, **KR 2000-25706** in view of **Gates** teaches each of the claimed features of, *inter alia*, instant claim 1, to every extent as does Applicant.

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Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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JP 11-265989 A (Lee et al.), US 6,048,765 (Lee et al.), and US 6,261,849 B1 (Lee et al.), each assigned to **Samsung Electronics**, discloses and claims an Al_2O_3 layer 110 on the exposed portion of the insulating layer of a capacitor.

US 6,350,642 B1 (Lee et al.), assigned to **Samsung Electronics**, discloses and claims a metal oxide layer 596 which may be Al_2O_3 in contact with the exposed portion of the insulating layer of a capacitor.

US 6,376,325 B1 (Koo) and US Patent Application Publication 2002/0127867 A1 (Lee), each assigned to **Samsung Electronics**, discloses and claims an Al_2O_3 layer 110 on the exposed portion of the insulating layer of a capacitor.

US 6,114,060 (Park et al.) and US 6,509,601 B1 (Lee et al.), each assigned to **Samsung Electronics**, discloses and claims an Al_2O_3 layer 110 on the exposed portion of the insulating layer of a capacitor which is deposited by ALD.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 703-306-5980. The examiner can normally be reached on 9:00 - 19:30 on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 703-308-4940. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Erik Kielin
March 26, 2003